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ABSTRACT

The amount of change resulting from the implementation of the Bibliographic Automation of Large Library Operations using a Time-sharing System (BALLOTS) is analyzed, in terms of (1) physical room arrangement, (2) work procedure, and (3) organizational structure. Also considered is the factor of amount of time the new system has been in use. Information resulting from a telephone survey to the head of cataloging for 44 participating BALLOTS libraries using the system for three months or more provides the basis for statistical analysis of these three aspects. Statistical analysis of the questionnaire follows chapters on a brief history of library automation for technical processing, and a library/non-library (i.e. industry) literature review of impact of automation on the work environment. Findings showed that the greatest amount of change occurred in work procedure, and the least amount in organizational structure. Libraries using BALLOTS more than 12 months perceived more change in organizational structure than those using the system for a shorter period. Appended are the questionnaire, lists of study population, library statistics, and response data by library. (SW)

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IMPACT OF THE BALLOTS SHARED CATALOGING SYSTEM ON THE AMOUNT OF CHANGE IN THE LIBRARY TECHNICAL PROCESSING DEPARTMENT

A Research Project

Presented to

the Faculty of the School of Business and Management

Pepperdine University

In Partial Fulfillment

of the Requirements for the Degree

Master of Business Administration

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April 1979

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ABSTRACT

The automation of library technical processing of bibliographic materials has been slow to be implemented and slow to be studied and understood. The belated application of automation to library activities is due in part to difficult development of feasible capabilities to handle widely differing item formats and special characters and alphabets for materials where each piece cataloged is different.

This study was undertaken to analyze one aspect of the effect of automation on library service--that is, the amount of change as perceived by the head cataloging librarian resulting from the installation and use of the Bibliographic Automation of Large Library Operations Using a Time-sharing System (BALLOTS) shared cataloging system in physical room arrangement, work procedure, and organizational structure by length of time using the system.

The problem for the study was as follows: What, if any, is the relationship between the installation and use of the BALLOTS shared cataloging system in a library technical processing department and the amount of change in that department's physical room arrangement, work procedures, and organizational structure? The amount of change in work environment as perceived by the head cataloging librarian after the installation and use of the BALLOTS shared cataloging system was examined, and an attempt was made to evaluate the relationship between the amount of change and length of time using the system.

The research design was a telephone survey wherein the head of cataloging for each participating BALLOTS shared cataloging library was questioned regarding amount of change perceived in work procedures, physical room arrangement, and organizational structure as a direct result of the implementation of the BALLOTS shared cataloging system in his library. It was expected that there would be a perception of greater change in work procedure and least change in organizational structure but that libraries using the system more than twelve months would perceive more change in organizational structure than libraries using the system twelve months or less.

The hypothesis of the study was supported with some significant change found to have occurred in work procedures and system use time greater than twelve months. The non-significant interaction and high-error effects indicated low

forecasting value of the effects; however, it is argued that the findings are representative of any system users in a similiar context.

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Chapter 1

INTRODUCTION

Automation of library processes is a development spanning four decades in the history of libraries. The application of on-line computer techniques to the control of library cataloging processes began as recently as 1971 when the Ohio College Library Center began its on-line operations. In 1976 Stanford University offered a second system for on-line shared cataloging--Bibliographic Automation of Large Library Operations Using a Time-sharing System (BALLOTS). However, the impact of automation on a profession which has played the role of preservation for society's written documents has been slow to be implemented and slow to be studied and understood.

The slow implementation of automation for library bibliographical processes is in part due to difficult development of feasible capabilities to handle widely differing item formats and special characters and alphabets for materials where each piece cataloged is different. The literature reflects the profession's conflicting attitudes toward steadily increasing concern with quantitative assessment of libraries and their services.[1]

> At the risk of oversimplification, these attitudes may be grouped into two opposing schools . . . . One school feels that some of the major benefits derived from libraries are intangible (i.e., not measurable) that attempts to quantify leads to the aggregation

> of units that are qualitatively different; that each library is unique and should be assessed in the context of its own particular history, constraints, users, and environments . . . . In contrast, the other school believes that it will eventually be possible to measure objectively the goodness of most, if not all, library services.[2]

The application of automation to library technical processing has not yet evidenced specific design for the provision of computer-produced management information statistics. To date very few libraries report either qualitative or quantitative analysis of technical processing activities either before or after the installation and use of an on-line shared cataloging system.

The research problem investigated in this paper is meant to contribute evaluative information to the professional literature by analyzing one aspect of library operations--that is, the amount of change in physical arrangement, work procedure, and organizational structure resulting from installation and use of the BALLOTS shared cataloging system in relation to length of time using the system.

THE RESEARCH PROBLEM

As a result of the interest in the programmatic goals of the BALLOTS system, library administrators are rightfully seeking information gained from analysis of the effects of the BALLOTS system on personnel, cost, internal procedures, and organizational structure. Whereas some

study has been done to chart trends and evaluate the effect of on-line cataloging systems on personnel and cost in individual or multiple libraries, very little has been done to determine the effect of the use of such an on-line shared cataloging system on the internal work environment in the technical processing department.

The question to be examined in this paper is as follows: What, if any, is the relationship between the installation and use of the BALLOTS shared cataloging system in a library technical processing department and the amount of change in that department's physical room arrangement, work procedures, and organizational structure?

The library profession places great value on the experience of one or more libraries as reported or sought by others. Furthermore, the budgetary constraints being imposed on libraries and the severe increases in library operating costs reinforces the library administrator's need for carefully processed information before commitments are made for automated systems.

Evaluation of the impact of the use of the BALLOTS shared cataloging system will provide valuable information not only for the library changing from a manual cataloging system to an automated one, but also for the library changing from one automated system to BALLOTS. Such information may serve to establish trends and to provide information which the library administrator may choose to employ in the administrative planning process.

STUDY HYPOTHESIS

The study hypothesis for this research paper can be stated as follows: The greatest amount of change in work environment would occur in work procedure; the least change would occur in organizational structure, and libraries using the system more than twelve months would perceive more change in organizational structure than libraries using the system twelve months or less. The amount of change in work environment as perceived by the head cataloging librarian after the installation and use of the BALLOTS shared cataloging system was examined, and an attempt was made to evaluate the relationship between the amount of change and length of time using the system.

DEFINITION OF TERMS

Terms defined below include system use time, technical processing, and work environment.

System Use Time

For the purposes of this paper "system use time" is meant to define the length of time in months a library has been using the BALLOTS shared cataloging system starting the day the training session is concluded.

Technical Processing

For the purposes of this paper, "technical processing" shall refer to all activities associated with the acquisition and cataloging of library materials.

Work Environment

For the purposes of this paper "work environment" is meant to encompass work procedures, physical room arrangement, and organizational structure.

RESEARCH DESIGN

The research was centered on an evaluation of the amount of change in work environment in libraries using the BALLOTS shared cataloging system. In a telephone survey, the head of cataloging for each participating BALLOTS shared cataloging library was questioned regarding amount of change perceived in work procedures, physical room arrangement, and organizational structure as a direct result of the implementation of the BALLOTS shared cataloging system in his library. Length of time of system use was determined from the BALLOTS Center records.

Using an analysis of variance test, it was hoped that there would be a direct relationship between the perceived amount of change in work environment and length of time using the system.

SUMMARY

The general concern of this paper is to evaluate whether relationships can be determined between amount of change in the work environment in a library technical processing department as a result of the implementation and

use of the BALLOTS shared cataloging system and length of time of system use.

A brief history of library automation for technical processing is provided in Chapter 2 to indicate the significance of the development of automated systems for shared cataloging.

Chapter 3 describes the impact of automation for library technical processing on work environment as obtained from the literature. This literature survey indicated several trends: the lack of evaluative tools designed to study library procedures, the infrequent application of evaluative tools used in other disciplines to library procedures, and the description of the effect of the automated technical processing by and in a single library.

Chapter 4 reviews a representative portion of the non-library literature describing the impact of automation on change of work environment in industry and the effect of automation on individuals.

Chapter 5 deals with the research methodology, quantitative analysis, and the testing results of the amount of change experienced by the libraries which implemented the BALLOTS shared cataloging system. Chapter 6 discusses the findings and implications of the study.

The research project was undertaken for several reasons: (1) no study has been made to determine relationships between library characteristics and amount of

change experienced as a result of the use of an automated shared cataloging system, (2) no study has been undertaken to gather or analyze the experience of libraries using the BALLOTS shared cataloging system, and (3) libraries presently using a competitive system (the Ohio College Library Center) are favorably influenced for programmatic reasons to change to the BALLOTS system and are requesting evaluative information regarding the impact of the use of BALLOTS in the technical processing department. It is hoped that this study will supply a portion of the data being requested.

NOTES ON CHAPTER I

[1]Lucile M. Morsch, "Scientific Management in Cataloging," Library Trends, II, 3 (January, 1954), 482.

[2]Richard H. Orr, "Measuring the Goodness of Library Services: A General Framework for Considering Quantitative Measures," Journal of Documentation, IXXX, 3 (September, 1973), 315.

[3]William J. Baumol and Matityahu Marcus, Economics of Academic Libraries (Washington, D.C.: American Council on Education, 1973).

Chapter 2

BRIEF HISTORY OF LIBRARY AUTOMATION FOR TECHNICAL PROCESSING

The history of the application of automation to library technical processing procedures indicates the significant impact of the development of the recognized standards for the format of cataloging information in machine-readable form. The Machine-Readable Cataloging (MARC) project begun in December, 1965, by the Library of Congress with a grant from the Council on Library Resources distributed the first tapes of English language monographs cataloged at the Library of Congress to sixteen libraries[1] in November, 1966. The enthusiasm of the participants persuaded the Library of Congress to continue tape distribution beyond the scheduled end of the project in June, 1967, while work proceeded on a revised record format called MARC II. The MARC II distribution service, beginning in April, 1969, had incorporated by 1972, national coding and format standards; retrospective conversion of English language monographs cataloged by the Library of Congress since 1968; format recognition--the automatic assignment of tags, indicators, and subfield codes to unedited bibliographic data; and so-called "popular titles" of Library of Congress cards ordered. In 1971, Cataloging-In-

Publication records were added to the distribution service. Records for other types of materials, such as audiovisual presentations, maps, and serials, were added in 1972 and 1973, and records for titles in languages other than English began to be added in 1973.

> By 1975, MARC records were being produced at a rate of approximately 127,000 titles per year, including all current Library of Congress cataloging in English, French, German, Spanish, and Portuguese, and and the total number of records available [had] passed half a million.[2]

In December, 1974, the Council on Library Resources funded the Conversion of Serials project whereby the Library of Congress accepts machine-readable serial records produced in the MARC format by other libraries, verifies the record, and redistributes them through the MARC distribution service.

Most automated cataloging systems initiated since 1969 utilized records distributed by the MARC Project, acclaimed as "the most significant development in the history of library automation."[3] The largest cataloging system--the Ohio College Library Center (OCLC) in Columbus, Ohio--began its on-line operations in 1971. Stephen R. Salmon noted:

> Perhaps no other system has had as much effect on library practice in this country; indeed, if the development of MARC is the most significant accomplishment to date in library automation, the development and operation of the Ohio College Library Center is probably the second most significant.

The Ohio College Library Center provides a common cataloging data base of more than 4.5 million records[5] used for searching, the off-line production of catalog cards for more than 1,000 participating libraries, and more importantly the creation of original cataloging records. Many off-line cataloging systems, and particularly the Library of Congress Card Distribution Service, have made catalog cards available to libraries at a low cost. However, significant savings as achieved by the individual library eliminates original cataloging activities for as much as 40 to 95 percent of books acquired.

Both MARC records and the cataloging records of member libraries contributed to the data base are displayed on a terminal in the local library. With the cataloging source document in hand, the machine-readable bibliographic record is modified to accurately represent the item, and the local holdings information is added. Catalog cards can then be produced in rough filing sequence following the local library's catalog card specification.[6]

In 1967, development began on the BALLOTS system at Stanford University, called "perhaps the most sophisticated technical processing system presently in operation."[7] The focus of the system was to create a flexible and reliable on-line system for bibliographic control in library technical processing activities "to reduce the workload by placing the burden of repetitive tasks on a machine system."[8]

The design of the system was to support operations in other areas of the library, as well as to support other libraries. "A long-term goal was to reduce per-unit costs for acquisition and cataloging, while allowing the library to handle more materials without a proportional increase in the size of the staff."[9]

The BALLOTS system has been in continuous operation since November, 1972, supporting cataloging and acquisitions processes at Stanford University. In November, 1976, BALLOTS implemented its "shared cataloging" module whereby users retain on-line their own records constructed either from records already in the data base or from original data entry. Today, 56 libraries use this system's unique searching capabilities, developed under another program called Stanford Public Information Retrieval System, with many files and indexes on-line and numerous automatic promptings from the computer to the terminal.[10]

A more recent system for on-line cataloging has been developed by the Washington State Library to meet the requirements best handled by automated procedures for all libraries in the state. Another on-line cataloging system developed by the University of Chicago for its library is proposed for consideration as the regional on-line cataloging support system of the Midwest.

Now, after nearly seven years of use, the on-line shared cataloging systems have proven to be successfully

installed and used. Development plans for new system capabilities continue with, among other plans, major announcements for an acquisition module by Washington Library Network (WLN), an interlibrary loan module by OCLC, and a shared acquisition module by BALLOTS.

The political and economic expansion program is becoming clearer for all systems: WLN to replicate its system in other states or geographically defined regions of the country, OCLC to increase growth through new users across the country and perhaps outside the boundaries of the United States, and BALLOTS to concentrate its marketplace by meeting economic equilibrium with academic research libraries across the country and all types of libraries in the state of California.

A new prospect of libraries changing from use of one of the four systems to another of the four is becoming real. The first to make the change is Yale University libraries, presently an OCLC user, which has chosen along with Columbia University libraries and the New York Public Library (which together comprise the Research Libraries Group) to use the BALLOTS system. The University of Michigan libraries and University of Pennsylvania libraries have formally indicated their interest in joining the Research Libraries Group which will result in a change from their use of OCLC to the BALLOTS system. The Cornell University libraries and Princeton University libraries have informally expressed their similar interest.

Another pattern is emerging. Where the OCLC system has been chosen for use in the central or main library on a single campus, the law libraries on the same campus are choosing to use the BALLOTS system for shared cataloging.[11]

NOTES ON CHAPTER 2

[1]Argonne National Laboratory, Georgia Institute of Technology, Harvard University, Indiana University, Montgomery County (Maryland) Public Schools, Nassau County (New York) Library System, National Agricultural Library, Redstone Scientific Information Center, Rice University, University of California Institute of Library Research, University of Chicago, University of Florida, University of Missouri, University of Toronto, Washington State Library, and Yale University.

[2]Library of Congress Information Bulletin, XXXIV, Appendix A (January 10, 1974) 9, 11, 14.

[3]Stephen R. Salmon, Library Automation Systems (New York: Marcel Dekker, 1975), p. 84.

[4]P. 106.

[5]Statistic noted by James Barrantine at the American Library Association, Library Automation Discussion Group meeting January 7, 1979 in Washington, D.C.

[6]For a more complete history and description of the OCLC system see: Art Plotnick, "OCLC for You--and Me?!" American Libraries, VII (May, 1976), 258-267.

[7]Salmon, p. 113.

[8]"Stanford University's BALLOTS System," Journal of Library Automation, VIII, 1 (March, 1975), 31.

[9]Ibid., p. 31.

[10]For a more complete bibliography of materials the BALLOTS system see: "Annotated List of BALLOTS Publications" (Stanford, California: Stanford University, n. d.).

[11]To date these campuses are: University of Southern California, University of LaVerne, and University of Utah.

Chapter 3

THE IMPACT OF AUTOMATION FOR LIBRARY TECHNICAL PROCESSING ON WORK ENVIRONMENT

A review of the published documents describing performance measures or systems analysis techniques to library operations, costs, and services indicates limited but distinctive patterns including the following:

1. General comments recognize the historic lack of evaluation techniques by library professionals in technical areas such as application of system analysis, information theory, operations research, management information systems, managerial accounting, and organizational theory.

2. Where technical evaluation of effectiveness is performed, the evaluation is generally concerned with: (a) cost measurement and (b) performance measurement in terms of user exposure to library materials as a reflection of library services, objectives, standards, and size of collections.[1]

3. Review of organizational change as a result of the application of automation to library technical processing activities is descriptive with few "before" and "after" comparisons.

Organization change in libraries is viewed as a factor of operational efficiency. Efficiency of library

technical processing operations is reviewed primarily using flowchart or time and motion study techniques. These techniques are reviewed by Richard M. Dougherty and Fred J. Heinritz,[2] and C. J. Wessel and others.[3] The Wessel study is cited by F. W. Lancaster as an "important" study containing a discussion of evaluation of libraries and on performance criteria, as well as a description of a number of potentially valuable evaluation techniques.[4]

The Wessel analytical techniques are: Service Components Reliability and Efficiency Analysis--designed to determine the success probability of a particular operation or service and its mean cost; Service Components Utility Analysis--designed to determine whether a library is allocating its resources to users; Correlation, Regression, and Effectiveness Analysis--designed to identify libraries that, within a group of institutions, deviate most from the norm from the standpoint of the cost or time involved in a particular operation; and Group Attainment and Methods Analysis--designed to analyze an operation systematically to identify unnecessary steps, to arrange necessary steps into an optimum sequence, to standardize work methods, and to develop standards for the time that should be spent on each step. These techniques might be applied profitably to the evaluation of library technical services, even though no report of such application was located.

The library administrators view of the effect of automation is currently articulated by Richard De Gennaro, director of libraries at the University of Pennsylvania. He noted that the literature of library automation in 1968 was limited in scope and falls into two categories:

> detailed technical papers written by systems librarians describing a specific application . . . [and] general or visionary papers written by information scientists or librarians speculating on how computer technology was going to change libraries in the future.[5]

In 1976 he noted that although:

> the most important and controversial issues of the sixties have been resolved or have simply become irrelevant . . . the identification and discussion of the various approaches to automation and the strategies for pursuing them has retained its importance as the major current issue in library automation.[6]

The analysis of these strategies for approaches to automation is for the most part missing from the literature.

Turning to the discussion of the various approaches to automation, one sees the pattern of the library automated activities of the 1970's emerging--the description, as opposed to the analysis, of the development of computer-based regional networks, vendor-supplied on-line services, minicomputer systems, and transfer or adaptation of locally developed systems. The expression and analysis of experience gained in the adaptation of these automated activities, and specifically the adaptation of the on-line shared cataloging system in single libraries, may be determined to have sufficient mutual similarity to be of benefit to the library planning to join the same system.

The discussion in the literature of specific effects of automation on library technical processing work environment falls into three categories: the effect of an automated cataloging system in the single library, survey of the users of a system, and the library administrator's perception of the effects of automation.

THE EFFECT OF AN AUTOMATED CATALOGING SYSTEM IN THE SINGLE LIBRARY

As an early member of the OCLC system, the Ohio State University's adoption of the innovative on-line shared cataloging system has resulted in "organizational and procedural changes . . . leading to greater efficiency and a greater degree of bibliographic control."[7] D. Kaye Gapen and Ichiko T. Morita provide perhaps the most detailed review of the effect of OCLC on the management of technical services through a detailed discussion, accompanied by organization charts and flow of materials flowcharts for the time periods fiscal 1969-1970, 1971, 1972-1976, and 1976-1976.[8]

The organization charts of 1969-1970 (Exhibit 1) and 1976-1976 (Exhibit 2) reflect the effect of OCLC on cataloging, card production, and public catalog maintenance. A quick editing unit, formed in late 1971 to handle searching and editing, labeling, duplicates, and automated file control, became a subunit of cataloging services in 1976. Also, by 1976 a bibliographic records division had

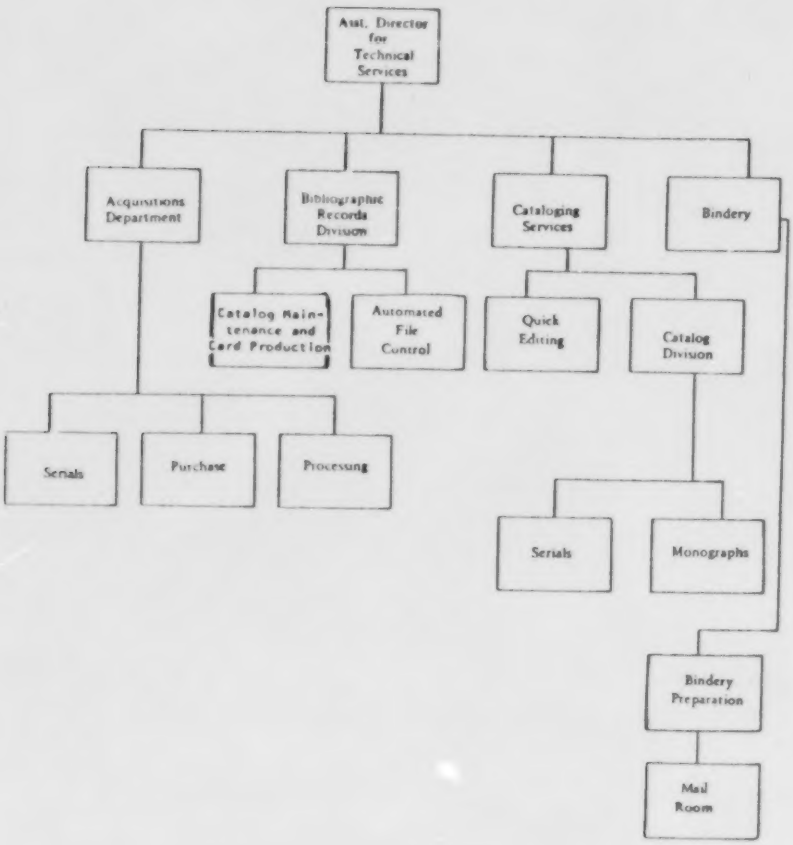
Exhibit 1

Ohio State University Library
Organization Chart, 1969-1970[9]

[9]Source: D. Kaye Gapen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Adacemic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 7. Used with permission.

Exhibit 2

Ohio State University Library
Organization Chart, 1974-1976[10]



[10]Source: D. Kaye Gapen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Academic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 18. Used with permission.

been established with the subunits catalog maintenance and card production and automated file control.

The workflow changed drastically as reflected in the work flow charts of 1969-1970 (Exhibit 3) and 1974-1976 (Exhibit 4). The use of the OCLC data base as an acquisition, cataloging, and searching tool; the use of Library of Congress cataloging as much as possible; the reassignment of work responsibility to streamline procedures; revised workflow to gain bibliographic control; and even work distribution and greater efficiency were major goals accomplished by these changes.

The use of the OCLC system at Temple University was reported by Joseph Z. Nitecki in 1974 to have had the following effects:

1. rigidity of scheduling needed for use of the OCLC terminal;

2. fewer but more advanced catalogers, with decreased demand for original cataloging;

3. reduced in-house card production and illumination of manual operations;

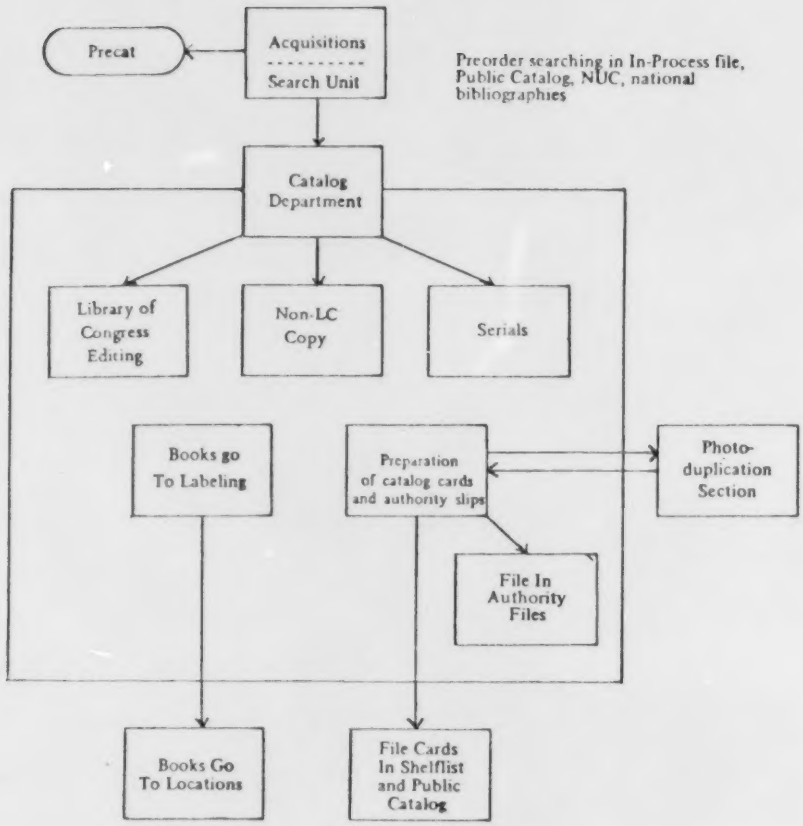
4. creation of temporary backlog collection awaiting Library of Congress copy;

5. searching and processing of materials is faster than the manual system;

6. slower preparation of instructions in original cataloging because it involves full, field-by-field

Exhibit 3

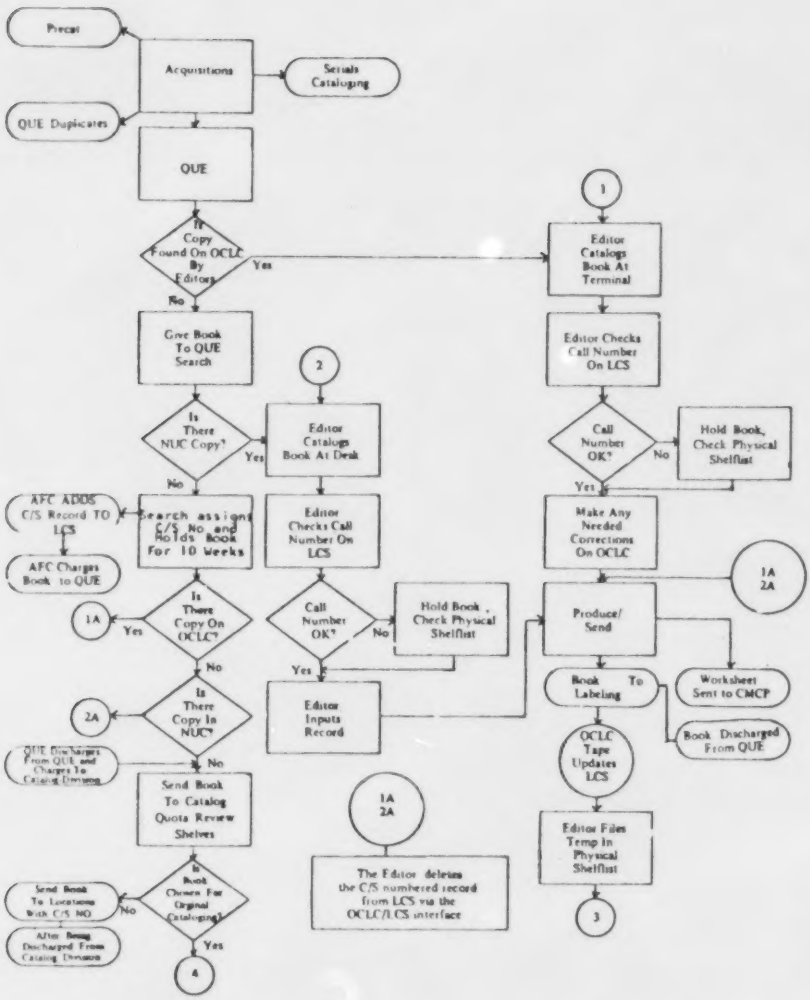
Ohio State University Library
Flow of Materials, 1969-1970[11]



[11]Source: D. Kaye Gapen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Academic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 8. Used with permission.

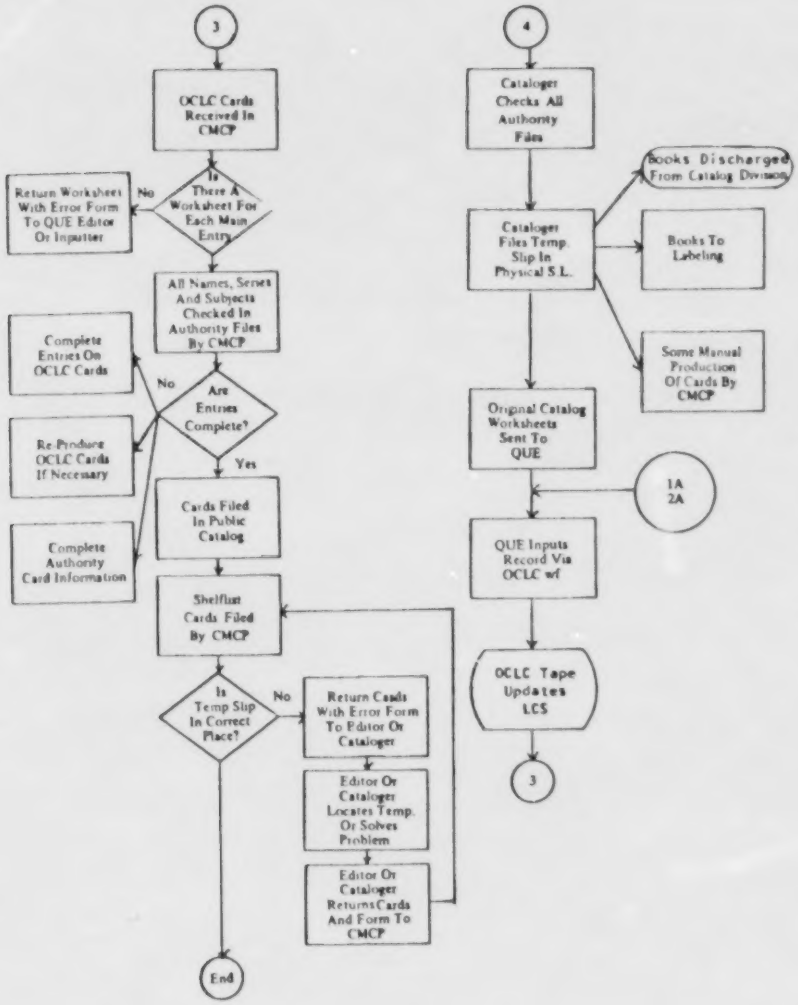
Exhibit 4

Ohio State University Library
Flow of Materials, 1974-1976[12]



[12]Source: D. Kaye Gapen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Academic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 19-20. Used with permission.

Exhibit 4 (continued)


3
OCLC Cards Received In CMCP
Is There A Worksheet For Each Main Entry
No
Return Worksheet With Error Form To QUE Editor Or Inputter
All Names, Series And Subjects Checked In Authority Files By CMCP
Are Entries Complete?
No
Complete Entries On OCLC Cards
Re-Produce OCLC Cards If Necessary
Complete Authority Card Information
Yes
Cards Filed In Public Catalog
Shelflist Cards Filed By CMCP
Is Temp Slip In Correct Place?
No
Return Cards With Error Form To Editor Or Cataloger
Editor Or Cataloger Locates Temp. Or Solves Problem
Editor Or Cataloger Returns Cards And Form To CMCP
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Some Manual Production Of Cards By CMCP
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OCLC Tape Updates LCS
3

AFC—Automated File Control
CMCP—Catalog Maintenance and Card Production
C/S—Control/Storage
LCS—Library Control System
QUE—Quick Editing

Source: D. Kaye Gapen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Academic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 19-20. Used with permission.

transcription of bibliographic data for keying-in purposes.[13] Nitecki also noted a problem with the lack of information about long-range planning of the OCLC system and its impact on recruiting and training in technical processing.[14]

Elaine Walker, Cornell University's catalog librarian, at a cataloging workshop held in Toronto in June, 1975, described the effects of the use of the OCLC system in the area of staff reduction--a major aspect of cost reduction--and a major concern for the library profession. She estimated that the catalog and catalog maintenance department requires seven fewer librarians and paraprofessional positions after installation of the OCLC cataloging support module and that two other paraprofessional positions had been downgraded. Three of the released positions were reassigned to other areas of technical services. The greatest impact on staffing changes came in the catalog maintenance tasks where the staff had been reduced from nineteen in fiscal year 1972-1973 to thirteen in fiscal year 1974-1975. The credit for staff saving is, however, attributed to the combined effect of reorganizing whole departments, workflow, new forms and work schedules, stratifications of tasks, and a careful consideration of requirements of man-machine environment.[15]

The Stanford University Library reports that a firm criterion was established so that "procedures and organizational structure would remain relatively stable

during the first implementation"[16] of use of the BALLOTS system for acquisitions and shared cataloging. Allen B. Veaner attributed this decision to recognition of two phenomenen: the large organization's micro-social structure which changes at a slower rate than external (macro) technologies and the BALLOTS system design with enough flexibility to support either continuance of existing procedures, radical change, or something in between.[17]

Notwithstanding, the use of the BALLOTS system had the following major work environment effects in procedures, physical setup, and organizational structure: physical consolidation of the acquisition and cataloging departments, with the movement of material arranged to produce a straight-through work flow; creation of the process in receipt procedure for materials with MARC copy; creation of a centralized searching unit; elimination of card preparation functions; terminal access schedules requiring work be batched and well organized; increased production levels; on-line control of books in the department; reduction of Title II and filing; and more systematic approach to matching books with incoming Library of Congress copy.[18] The staff was reduced in size from 85 to 73 (eliminating one professional and eleven clerical positions) through elimination of certain activities through procedural changes. Staff members previously assigned to specialized activities generalized their knowledge so that advantage

could be taken of the ability to carry out any function at any terminal.

SURVEY OF THE USERS OF A SYSTEM

A study of twelve libraries in Ohio was undertaken in 1975 by a team of catalog librarians at Kent State University with the goal "to aid in more effective use of human resources in Technical Services in OCLC libraries and in other libraries contemplating network affiliation."[19] The study revealed no one striking model.

> Growth or decline in staff totals, alterations in workflow, departmental mergers or reorganizations seem determined by the mission of, and constraints on, an individual library. OCLC appears to be a support mechanism capable of unique in-house adaptations, rather than a determining factor in what shall be done, or by whom.[20]

This study brings out the danger of deception by the post hoc, ergo propter hoc fallacy. Reduction in staff was attributed to budget crunch, shrinking student population, and changes in rate and type of acquisition, as well as to the use of OCLC. However, small but significant adaptations were noted in that staff were freed at two ends of the personnel continuum--lower-skill tasks were reduced, while librarians reported more time to engage in intellectual activity with less attention devoted to clerical detail.

Findings recorded by Joe A. Hewitt from interviews of OCLC charter members and on-site observations between May and September, 1974, indicate similar results. The major

impact was the improved speed with which books were cataloged. Staff reduction was affected as much by the existing staffing levels and the administrator's commitment to the objective of staff reduction as it was by on-line shared cataloging. After three years, only nine libraries (20 percent) had reorganized the departmental structure of technical processing, with the tendency toward reorganization being strongest in the largest libraries.[21] "While some administrators recognize that their existing structures are not optimal, they have found them satisfactory, and have avoided the disruption that reorganization might cause to the status and relationships of the staff."[22]

A survey by Peter Spyers-Duran in August, 1977, of some 130 state-supported academic libraries having a budget of one million dollars or more reported the effects of automation on organizational change with particular concern for staffing of catalog departments. In this survey, 80 percent of the head catalogers reported an organizational change after automation, with the most frequent change being the merger of bibliographic searching with cataloging. Catalogers reported improved workflow, more efficient work space organization, reduced backlogs, increased productivity, changes in work assignment and scheduling, expansion of duties, and greater independence for those individuals working on computer terminals. Seventy-four

percent of head catalogers viewed their staff as a group favorably disposed toward change. Yet this same group of catalog departments reported certain common staff concerns differing only in degree of intensity and number of staff involved. Such concerns were noted as anxiety about dislocation from duties, changes in scheduling of the work week, lack of opportunity for advancement, lay-offs, new and sometimes higher levels of assignment, reluctance to learn and accept a new technology, and resistance to give up old ways.[23]

THE LIBRARY ADMINISTRATOR'S PERCEPTION OF THE EFFECT OF AUTOMATION

It has been noted above that the administrator's commitment to change can be an important factor in the amount and type of change occurring as a result of the implementation of an on-line shared cataloging system. Although the literature contains very little discussion of the administrator's perception of this change, the sparse amount contains a common thread--the concern for the impact of automation on staff including catalogers, paraprofessionals, and clerical staff. The single person most authoritative to comment on the essential elements comprising what is characterized as the "climate for effort" is David C. Weber, director of libraries at Stanford University where the BALLOTS system was developed.[24] He noted that:

> the importance of telling the entire library staff what is being done in regard to automation--and why-- . . . [and] the effort to explain a program concisely but clearly to the library staff, students, faculty, and other university staff can be highly rewarding in understanding, and in moral and financial support.[25]

Creating the environment for change can lead to the successful acceptance of change even when, as is noted by Gunter Pflug, "neither librarians nor the computer experts . [can satisfactorily recognize] the side effects which automation exercises on the structure of the work processes of the library."[26] Pflug cited four side effects which usually occur but noted that as a matter of principle, in all cases these effects can be eliminated by a change in the conditions of work: personnel problems; problems caused by the departmental arrangement of libraries; problems of work processes; and problems of libraries shaped by library by outside forces, respectively.

The role of the cataloger explored in a series of papers presented in the Journal of Academic Librarianship discusses the future, accepting as a fait accompli change resulting from the use of on-line shared cataloging systems. The papers discuss potential change in catalogs and catalogers resulting from the changes in technical processing at the Library of Congress and its effect on libraries and librarians throughout the country. Closing the card catalog, new cataloging rules, new emphasis on service, alternative methods for processing materials, and new roles for the technical processing staff are inevitable.[27]

SUMMARY

In the seven years between 1971 and the present, very little has been reported regarding the level of change experienced by the more than 1,000 libraries using on-line shared cataloging systems. Of the few libraries reporting, most are descriptive diary-style narrative. Little disagreement exists within the literature that a pattern for change has not been established. Where change has occurred, it was supported with the encouragement of the library director.

NOTES ON CHAPTER 3

[1]For a more complete discussion see: Lucile M. Morsch, "Scientific Management in Cataloging," Library Trends, II, 3 (January, 1954), 471-482; Richard H. Orr, "Measuring the Goodness of Library Services: A General Framework for Considering Quantitative Measures," Journal of Documentation, XXIX, 3 (September, 1973), 315-332; and Helen M. Welch, "Technical Services Costs, Statistics and Standards," Library Resources and Technical Services, XI, 4 (Fall, 1967), 436-442.

[2]Scientific Management of Library Operations (Metuchen, New York: Scarecrow Press, 1966).

[3]Criteria for Evaluating the Effectiveness of Library Operations and Services (Washington, D. C.: [illegible] Co., 1969).

[4]The Measurement and Evaluation of Library Services (Washington, D. C.: Information Resources Press, 1977).

[5]"Library Automation: Changing Patterns and New Directions," Library Journal, LI (January 1, 1976), 175.

[6]"The Development and Administration of Automated Systems in Academic Libraries," Journal of Library Automation, I, 1 (March, 1968), 76.

[7]D. Kaye Cagen and Ichiko T. Morita, "OCLC at OSU: The Effect of the Adoption of OCLC on the Management of Technical Services at a Large Academic Library," Library Resources and Technical Services, XXII, 1 (Winter, 1978), 21.

[8]Pp. 5-21.

[9]Cagen and Morita, p. 7.

[10]Ibid., p. 10.

[11]Cagen and Morita, p. 8.

[12]Ibid., pp. 19-20.

[13]OCLC in Retrospect: A Review of the Impact of the OCLC System on the Administration of a Large University Technical Services Operations (Philadelphia: Temple University Libraries, January, 1974).

[14]P. 35.

[15]Ryeburn M. Ross, "Cost Analysis of Automation in Technical Services," in Proceedings of the 1976 Clinic on Library Applications of Data Processing: The Economics of Library Automation. Papers presented at the 1976 Clinic on Library Applications of Data Processing, April 25-28, 1976. Edited by J. L. Divilbiss. Urbana-Champaign, Illinois: University of Illinois, Graduate School of Library Science, 1977), p. 21.

[16]Allen B. Veaner, "BALLOTS--the View from Technical Services," Library Resources and Technical Services, XXI, 2 (Spring, 1977), 141.

[17]P. 141.

[18]For a more complete discussion see: "Stanford University's BALLOTS System," Journal of Library Automation, VIII, 1 (March, 1975), 31-50; Allen B. Veaner, "BALLOTS--the View . . . ," 127-146; and Allen B. Veaner, "BALLOTS: Bibliographic Automation of Large Library Operations," in E. Edelhoff and K. D. Lehmann (eds.). On-Line Library and Network Systems (Frankfurt am Main: Klostermann, 1977), pp. 130-140.

[19]Anne M. Allison, "Impact of OCLC on Catalog Departments: A Study," Network, II, 1 (January, 1975), 11.

[20]Ibid., p. 11.

[21]"Impact of OCLC; the Good and the Bad as Recorded by Researcher Joe A. Hewitt in an Epic Journey to Every Charter Library of the On-line System," American Libraries, VII (May, 1976), 268-275.

[22]Ibid., p. 273.

[23]The Effects of Automation on Organizational Change, Staffing and Human Relations of Catalog Departments Unpublished Paper Presented at the Conference on Management Issues in Automated Cataloging, November 3-5, 1977, Sponsored by the Associated Colleges of the Midwest. (November, 1977).

[24]"Personnel Aspects of Library Automation," Journal of Library Automation, IV, 1 (March, 1971), 33.

[25]P. 34.

[26]"Effects of Automation on Library Administration," International Federation of Library Associations Journal, I, 4 (1975), 267.

[27]Tillie Krieger (ed.), "Catalogs and Catalogers: Evolution Through Revolution," Journal of Academic Librarianship, II, 4 (September, 1975), 172-179.

Chapter 4

THE IMPACT OF AUTOMATION IN THE NON-LIBRARY WORK ENVIRONMENT

A review of the general literature describing the impact of automation on work environment falls into three categories: the effect of automation within a single industry, the effect of computer-induced technological change on organizational structure, and the effect of technological change on the individual. Characteristics of these three categories are outlined in this chapter.

THE EFFECT OF AUTOMATION WITHIN A SINGLE INDUSTRY

Characteristics of publications describing the effects of automation within a single industry which study the impact of automated techniques on the work environment in banking, the office, and the factory are discussed in this section. Techniques most frequently used for data gathering are the interview, personal observation, and the questionnaire.

Jon M. Shepard in Automation and Alienation: A Study of Office and Factory Workers studied the question: "Does a worker's unique relationship to technology engender in him a set of feelings about work that is distinguishable from others laboring under different man-machine relationships?"[1]

Three man-machine relationships were workers in a nonmechanized production system, workers in a mechanized production system, and operators or monitors in an automated production system. He concluded that technology in the office has not led to a convergence in work attitudes among mass-production factory workers and office employees in any one of the man-machine relationships in the office. He also concluded that the belief that mechanization and automation in the office would produce a convergence by office and factory workers as a whole does not appear warranted.[2] Additionally, Shepard found support for the use of job enlargement as a means for decreasing alienation among factory workers. The reduction of job specialization appears to exercise salutary effects on work attitudes, and the thesis that automation reverses the historical trend toward increased alienation from work among factory workers appears to be supported.[3]

A study of commercial banking systems done in 1964 failed to reveal any radical impact of automation despite the fact that many banks employed high-powered computers at that time. A review of impact on employment showed that an offsetting factor to personnel reduction increased revenue-producing capability, impact on organization structure showed a move toward centralization and a decentralization of decision making, and impact on managerial functions showed a "professionalization" of management and a rise in

status for officers directly associated with automation. However, the author of the study reflected the notion that a single path may be viewed as representative or even normative and warned that automation is so diverse a process as to make all generalizations totally invalid.[4]

In review of a typical stage in the trend toward automation in the factory, Charles R. Walker rated the adjustment of human nature to a technological environment.

> Even without conscious guidance it is astonishing how the human group adapts to its environment to fit its own needs. This, of course, takes time and is wasteful. Nevertheless, as this case history abundantly shows, men as individuals and as groups are continually rejecting what is hostile to them, embracing what is good, pushing sometimes slowly, sometimes through sudden eruptions of human energy, to humanize and socialize even the most rigid of environments.[5]

In contrast, companies studied in 1964 by Otis Lipstreu and Kenneth A. Reed reported the following findings in support of their agreement that new advances in automation are so revolutionary as to rate new personnel syndromes and production problems: downturn in morale, centralization of managerial control, personnel policies and procedures becoming more important than formerly to profit-making function of any company engaged in automatic transition, no support for expectation that automation would enhance on-job satisfaction of workers, displacement, higher degree of centralization in regard to introduction of new products, changes in scheduling procedures, higher quality of product, quality control handled more systematically, and greater output.[6]

Thomas L. Whisler reported various changes generated by computer applications of the life insurance industry on organizational structure, decision making, authority and control, and job content. Pertinent to this paper are his findings of the impact of automation on organizational structure: blurring of the traditionally sharp distinction between line and staff will continue, the issue of whether centralization will increase in the future will remain open for some time, changes in department structure and alignment of functions will continue, continued reduction of clerical workforce is foreseen, department structure will evolve toward functionalization, and the organizational role and location of the computer function will be an important but still unresolved issue. He saw as unresolved the issues of computers centralizing control in an organization because of lack of knowledge regarding changes in the technology, managerial job content, and the future organizational structure.[7]

THE EFFECT OF COMPUTER-INDUCED TECHNOLOGICAL CHANGE ON ORGANIZATIONAL STRUCTURE

No clear trends can be determined in the review of the literature describing the effect of automation on organizational structure. The strongest statement to support this comment was made by Whisler, "The impact of technology does not seem to be all pervasive. There is little support for treating technology as an imperative; it

does not seem to dictate structure."[8] Support of the similar argument was given by Victor Z. Brink in his report on the top management view of the computer[9] and by Henry C. Lucas, Jr. in his comparison of knowledge held in 1970[10] with the earlier predictions of Harold J. Leavitt and Whisler.[11] Roger C. Vergin saw no major organizational changes but a series of minor changes in the firms studied.[12] Brink and Lucas cited a common view that a realignment of flow of work and new work responsibility will result in a natural realignment of organization responsibilities and structure. Lucas believed that computerization tends to reduce the number of management levels but that studies to date "have failed to report any significant findings on the effect of computers upon management."[13] He supported his contention six years later and further stated that it is difficult to find an overall trend regarding the effect of automation on unemployment levels, jobs and job content, replacement, or displacement.[14]

Change as a result of automation does appear to be enhanced by favorable worker and managerial attitudes. This view is supported by William F. Blose and Earl E. Goetze,[15] and James C. Taylor.[16] Taylor stressed the concern for humanizing the organization and noted that permanence in change effects would be enhanced where favorable attitudes reinforced simultaneous or subsequent behaviors and that such goodness of fit between new behaviors and the work

situation was greater in high technology groups than in low-technology groups.[17]

Although no clear trends are established with regard to the effect of automation on organizational structure, a common thread can be found in statements regarding a move toward centralization. This view is expressed by Vergin, who noted a centralization of the information gathering and processing function.[18] James C. Emery suggested that decentralization has been largely negatively motivated and that "available evidence clearly supports the view that advances in information technology will lead to greater centralization."[19]

THE EFFECT OF TECHNOLOGICAL CHANGE ON THE INDIVIDUAL

> Man is highly ambivalent about change . . . . Change and variety in life are highly prized, but so are predictability and continuity . . . . Perhaps what is most disturbing psychologically about the technological changes we are now confronted with is what we sense to be the extended nature of these changes and a seemingly unending and accelerating rate of change.[20]

So stated Floyd C. Mann in his presentation to the American Assembly meeting held at Columbia University in 1962.

Attitudes and perceptions of technological systems must be favorable, however, if these new systems are to succeed. According to Lucas, favorable attitudes emanate, in order of importance, from perceived high technical

support, and user-oriented policies and involvement in systems design.[21] It is clear that technical problems have to be solved so that systems are of high technical quality. However, organizational and behavior variables have to be considered if successful systems are to be designed.

Worker attitudes toward change take many forms and can be responsible for the success or failure of the automated system. Douglas McGregor classified human needs that motivate human behavior into a series of ranks or levels:

1. physiological needs such as food, shelter, or sleep;
2. safety needs;
3. social needs such as to be accepted by others;
4. ego needs such as self-esteem; and
5. self-fulfillment needs such as to be creative.

Resistance is precipitated when certain basic needs are being threatened by proposed change. A fear of loss of employment and reduction in salary may be perceived as a threat to safety need satisfaction, fear of reorganization of departmental and work groups may be perceived as a reduction in social need satisfaction, and fear of loss of status and prestige may be perceived as a reduction in ego-need satisfaction.[22]

It is not only the actual change of employment, however, but the fear of change that may disturb both

workers and supervisors.[23] Reactions to change have been grouped into three broad classifications by Ida R. Hoos: (1) clay pigeon: resigned to let fate take its course; (2) exclusion hypothesis: a psychological rejection of painful reality; and (3) gravy train response: gone overboard for automation.[24]

Although resistance to change is more often discussed in terms of employee resistance, a greater obstacle to successful computer operations may be managerial resistance to change if a threat to ego-need satisfaction is perceived as a result of change.[25] The person most affected and most resistant to change is the middle manager.[26] His involvement, cooperation, and support is essential, however, because he or the first-line supervisor is the key communication figure.[27] He must be in possession of all the necessary information and he must approve it. Top management must devote a great deal of time and attention to involving departmental managers in decisions that are being made and ensure that these managers see themselves as agents of change and not as its victims.

Because role ambiguity and role conflict cause stress, the appointment of a change agent may be an essential step in conflict resolution. The role of the change agent is to work with both line and staff personnel, gather data, anticipate organizational and people problems, improve communications, reduce defensiveness among groups

and individuals, promote problem-solving conflict resolution, and provide feedback of data to all levels.

Involvement by top management in planning for change is seen as the most important single factor determining the success or failure of a computer installation.[28] Constructive change, being a gradual process and structured set of activities designed to alter the behavior and relationships of people in groups, must proceed from the top of the organization down.[29] Walter Buckingham stated that the success with which a transition to automation can be effected depends on management's ability to enlist the support of the workers involved. This support in turn depends on management's conception of the problems encompassed by the changeover. People do not resist technological change as much as they do the social change that accompanies it. Workers accept new technology and social conditions easily when consulted in advance and allowed to plan and participate in the changeover.[30]

Good communication, in fact, is the key to avoiding or ameliorating all the human relations problems of change.[31] People accept change much more readily if they understand the reasons for it and if they are given ample warning so that they have time to get accustomed to the idea well before they are personally affected by it. Similarly, the worries and tensions which change brings are eased if those involved have the chance to discuss it and put forward their

own views. Readiness to listen to such views provides reassurance against suspicions of management arbitrariness.

The essence of successful introduction of the automated system seems to be to avoid startling people and to have a program to reduce employee resistance. Srch programs, in addition to effective communication should incorporate such factors as the following:

1. Involvement of the affected in the change planning: Resistance may be expected from employees and managers because of significant changes occurring in the alignment of work groups, in the content of individual jobs, and in the methods of performed tasks. Proper planning and leadership can reduce this resistance.

2. Reduction of employee resistance: In many cases company personnel have not been convinced of the merits of the changes taking place. Personnel preparations should receive considerable attention during the feasibility study period and at the time that technological preparations are being made so that employees will accept changes with a minimum of resistance.

3. Comprehensive training programs: Where trainees are able to see, study, and operate the actual machines used in new production processes, tension and resistance can be reduced.

4. Analysis of anticipated individual reactions: It has been found that employees react differently to systems

based on age, sex, and position in the organization. Different approaches to change are appropriate for different individuals.

5. Alleviate hardships caused by job displacement: Automation brings about vast changes within the organization whereby work groups are shifted and reassigned. The important relationships between satisfaction and associations on the job deserve considerable attention.[32]

SUMMARY

The general literature describing the impact of automation in the non-library environment discusses the effects on the sole or multiple sites of a single industry on organizational structure and on the indivdual. No trends in organizational structure can be clearly established and no generalizations drawn with the one emerging exception of a move toward centralization.

Studies discussing the effect which automation has on the individual echo the common theme that mechanization, regimentation, and standardization have psychological and social prices for the employee as well as for the manager. Good communication, active discovery learning, and participation in the change process by those affected by change are essential to have favorable attitudes leading toward successful technological implementation.

NOTES ON CHAPTER 6

[1] (Cambridge, Massachusetts: M.I.T. Press, 1971), p. 107.

[2] p. 115.

[3] pp. 116-117.

[4] Boris Yavitz, Automation in Commercial Banking: Its Process and Impact. A Case Study and Conceptual Analysis (New York: Columbia University and the Free Press, 1967), p. 131-151.

[5] Charles R. Walker, Toward the Automatic Factory: A Case Study of Men and Machines (New Haven, Connecticut: Yale University Press, 1957), p. xxii.

[6] Transition to Automation: A Study of People, Production, and Change (Boulder, Colorado: University of Colorado Press, 1964).

[7] The Impact of Computers on Organizations (New York: Praeger, 1970), pp. 163-168.

[8] p. 195.

[9] "Top Management Looks at the Computer," in William C. House (ed.), The Impact of Information Technology on Management Operation (Princeton, New Jersey: Auerbach, 1971), pp. 170-171.

[10] Computer Based Information Systems in Organizations (Chicago: Science Research Associates, Inc., pp. 241-251.

[11] "Management in the 1980's," Harvard Business Review, XXXVI, 6 (November-December, 1958), 41-48.

[12] "Computer-Induced Organizational Changes," in in William C. House (ed.), The Impact of Information Technology on Management Operation (Princeton, New Jersey: Auerbach, 1971), pp. 178-189.

[13] Computer . . . . p. 243.

[14] Information Systems Concepts for Management (New York: McGraw-Hill, 1977), p. 63.

[15] "On-line Processing--How Will it Affect Your Organizational Structure?" in William C. House (ed.), The Impact of Information Technology on Management Operation (Princeton, New Jersey: Auerbach, 1971), pp. 190-203.

[16]Technology and Planned Organizational Change (Ann Arbor, Michigan: Institute for Social Research, University of Michigan, 1971).

[17]P. 96.

[18]P. 185.

[19]"The Impact of Information Technology on Organizations," in William C. House (ed.), The Impact of Information Technology on Management Operation (Princeton, New Jersey: Auerbach, 1971), p. 151.

[20]Floyd C. Mann, "Psychological and Organizational Impacts," in American Assembly, Columbia University, Automation and Technological Change (Englewood Cliffs, New Jersey: Prentice-Hall, 1962), p. 65.

[21]The Problems and Politics of Change: Power, Conflict, and the Information Services Subunit (Stanford, California: Graduate School of Business, Stanford University, March, 1972), p. 9. and Why Information Systems Fail p. 68.

[22]Douglas McGregor, The Human Side of Enterprise New York: McGraw Hill, 1960), pp. 31-36.

[23]James R. Bright, Automation and Management Cambridge, Massachusetts: Harvard University, 1958), p. 210.

[24]Automation in the Office (Washington, D. C.: Public Affairs Press, 1961), pp. 59-64.

[25]Donald H. Sanders, Computers and Management (New York: McGraw Hill, 1970), p. 329.

[26]Edgar F. Huse, "The Impact of Computerized Programs on Managers and Organizations: A Case Study in an Integrated Manufacturing Company," in Charles A. Myers (ed.), The Impact of Computers on Management (Cambridge, Massachusetts: M.I.T. Press, 1967), p. 302.

[27]T. B. Ward and Enid Mumford, Computers: Planning for People (London: B. T. Batsford Ltd., 1968), p. 144.

[28]Sanders, p. 143.

[29]David G. Bowers, Systems of Organization: Management of the Human Resource (Ann Arbor, Michigan: University of Michigan Press, 1976), p. 136.

[30]Automation: Its Impact on Business and People (New York: Harper, 1961), pp. 132-137.

[31]Frank Broadway, The Management Problems of Expansion (London: Business Publications Limited, 1966), p. 127.

[32]For a more complete description see: Liam Gorman and Cathal Mullan, "Human Aspects of the Management of Technological Change: A Case Study," Journal of Management Studies, X, 1 (February, 1973), 48-61; Hoos; Richard A. Johnson, Employees--Automatior--Management (Seattle: Bureau of Business Research, College of Business Administration, University of Washington, 1961); Otis Lipstreu and Kenneth A. Reed, Transition to Automation: A Study of People, Production, and Change (Boulder, Colorado: University of Colorado Press, 1964).

Chapter 5

RESEARCH METHODOLOGY AND QUANTITATIVE ANALYSIS OF THE AMOUNT OF CHANGE IN THE LIBRARY TECHNICAL PROCESSING AUTOMATED WORK ENVIRONMENT

The research methodology, quantitative analysis, and the testing results of the amount of change experienced by the BALLOTS shared cataloging system are explored in this chapter.

METHOD

Raw data were taken in the form of judgment of the head cataloging librarian in the technical processing department for each library having installed the BALLOTS shared cataloging system by the end of August, 1978, and having used the system for no less than three months as of November, 1978. The head cataloging librarian was familiar in every case with the amount of change which occurred as a direct result of the installation and use of the BALLOTS system.

All libraries having installed and used the BALLOTS shared cataloging system for no less than three months as of November, 1978, participated in the study (See Appendix A). This study population of 44 libraries included academic, public, and special libraries across the United States ranging in collection size from 300 volumes to 4,917,330

volumes (See Appendix B). The three-month use period cutoff criteria for libraries included in the study was established to accommodate a normal training period during which library taff was trained in system use and by the end of which the average monthly rate of system use was normally achieved.

In a telephone survey, each of the 44 librarians was first asked to respond to a list of the changes which occurred in physical room arrangement as reported in the literature by libraries using an on-line cataloging system. Each librarian was then asked to list additional physical changes not so reported. The same requests were posed for work procedure and organizational structure changes (See Appendix C). The purpose of this information (See Appendix D, Part A) was to aid the librarian to recall and focus on actual changes which occurred as a direct result of BALLOTS system installation and use.

Each librarian was then asked to rate the perceived changes in physical room arrangement, work procedure, and organizational structure using a thirteen-point scale as is described in Exhibit 5 (See Appendix D, Part B). Finally, each librarian was asked to indicate positive and negative factors (See Appendix D, Part C), if any, influencing the amount of change in work environment resulting directly from the installation and use of the BALLOTS shared cataloging system. The purpose of this question was for supplementary information. System use time was categorized by date of

Exhibit 5

Thirteen-Point Rating Scale

Catalog librarians gave ratings using these terms:		Numerical translations enabling analyses:
Great:	plus	13
	straight	12
	minus	11
Above average:	plus	10
	straight	9
	minus	8
Average:	plus	7
	straight	6
	minus	5
Very Little:	plus	4
	straight	3
	minus	2
None:	straight	1

NOTE: The head catalog librarian rated each degree across the five-point scale: great through none. Once they had entered a category (as: average), they were asked to qualify the rating as necessary (as: straight, plus, or minus) to express their judgment with greater precision. This rating resulted in a highly sensitive thirteen-point scale that permitted fine differences in judgments to be detected.

installation into three time spans: one to six months, seven to twelve months, and over thirteen months (see Appendix E).

FINDINGS

Raw data (individual ratings) and means for ratings for amount of change in work environment (physical room arrangement, work procedure, and organizational structure) given by 44 head catalog librarians using the BALLOTS shared cataloging system in each of three time spans (one to six months, seven to twelve months, and over thirteen months), are shown in Exhibit 6. These data were tested using a two-way analysis of variance, results of which are shown in Exhibit 7. Mean differences associated with statistically significant effects for work environment were tested using the Tukey HSD, results of which are shown in Exhibit 8. Mean differences associated with statistically significant effects for system use time and work environment were tested using t ratios, results of which are shown in exhibits 9, 10 and 11. Findings are summarized in Exhibit 12.

The main effect, work environment change, was statistically significant at the 1 percent level of confidence but was weak, accounting only for some 16 percent of the variation. Mean ratings for work environment change were: work procedure, 7.6, falling in the lower "above average" range and physical room arrangement, 5.5, and organizational structure, 4.4, both falling in the lower

Exhibit 6

Worksheet Showing Raw Data and Means

SYSTEM USE TIME/MONTHS	WORK ENVIRONMENT CHANGE: Physical Room Arrangement (PRA)	Work Procedure (WP)	Organizational Structure (OS)	
1-6 Months	5 3 10 7 1 8 2 2 7 9 $n = 10$ $\Sigma X = 54$ $\Sigma X^2 = 386$ $\bar{X} = 5.4$	6 6 6 10 2 5 3 3 11 9 $n = 10$ $\Sigma X = 61$ $\Sigma X^2 = 457$ $\bar{X} = 6.1$	1 6 9 1 1 5 1 1 6 7 $n = 10$ $\Sigma X = 38$ $\Sigma X^2 = 232$ $\bar{X} = 3.8$	$n_{1-6} = 30$ $\Sigma X_{1-6} = 153$ $\bar{X}_{1-6} = 5.1$
7-12 Months	3 3 7 6 2 5 6 7 2 4 10 5 3 $n = 13$ $\Sigma X = 63$ $\Sigma X^2 = 371$ $\bar{X} = 4.8$	5 10 10 11 4 10 7 10 6 9 10 5 2 $n = 13$ $\Sigma X = 99$ $\Sigma X^2 = 857$ $\bar{X} = 7.6$	1 6 5 10 1 5 2 6 1 1 7 4 1 $n = 13$ $\Sigma X = 50$ $\Sigma X^2 = 296$ $\bar{X} = 3.8$	$n_{7-12} = 39$ $\Sigma X_{7-12} = 212$ $\bar{X}_{7-12} = 5.4$
13+ Months	1 6 6 3 5 2 4 6 6 9 6 10 5 6 6 11 6 6 4 8 11 $n = 21$ $\Sigma X = 127$ $\Sigma X^2 = 907$ $\bar{X} = 6$	2 10 8 5 9 11 6 5 2 8 8 12 10 12 10 12 8 8 7 10 12 $n = 21$ $\Sigma X = 175$ $\Sigma X^2 = 1641$ $\bar{X} = 8.3$	1 5 7 2 3 10 5 2 2 10 3 10 2 5 4 10 3 6 6 6 2 $n = 21$ $\Sigma X = 104$ $\Sigma X^2 = 696$ $\bar{X} = 5$	$n_{13+} = 62$ $\Sigma X_{13+} = 406$ $\bar{X}_{13+} = 6.5$
	$n_{PRA} = 44$ $\Sigma X_{PRA} = 244$ $\bar{X} = 5.5$	$n_{WP} = 44$ $\Sigma X_{WP} = 335$ $\bar{X} = 7.6$	$n_{OS} = 44$ $\Sigma X_{OS} = 192$ $\bar{X} = 4.4$	$N = 132$ $\Sigma\Sigma X = 771$ $\Sigma\Sigma X^2 = 5843$ $\bar{X} = 5.8$

Exhibit 7

Summary of Analysis of Variance

Source of Variance	SS	df	MS	F	p	η^2	est. ω^2
Work Environment	238.13	2	119.07	14.92**	<.01	.18	.16
System Use Time	88.01	2	44	5.51**	<.01	.06	.05
Work Environment x System Use Time	(28.58)	4	(7.1)	(.89)	>.05(NS)	(.02)	——
Error	1042.1	123	8.47	——	——	.78	——
Pooled Error	1013.52	127	7.98	——	——	.02	——
Totals	1339.66	131	——	——	——	1.00	——

$F_{.05,4,125} = 2.44$

$F_{.05,2,125} = 3.07$

$F_{.01,2,125} = 4.78$

Exhibit 8

Table of Work Environment Change Mean Differences, Tukey HSD Test for Significance of Mean Differences

		Work Procedure 7.6	Physical Room Arrangement 5.5	Organizational Structure 4.4
Work Procedure:	7.6			
Physical Room Arrangement:	5.5	2.1**		
Organizational Structure:	4.4	3.2**	1.1	

$$HSD_{.05,120,3} = 3.356 \sqrt{\frac{7.98}{44}} = 1.43$$

$$HSD_{.01,120,3} = 4.2 \sqrt{\frac{7.98}{44}} = 1.79$$

* = $p < .05$
** = $p < .01$

Exhibit 9

t Ratios for Significance of System Use Time (SUT)
Mean Differences

SUT/13+ - SUT/7-12 = 6.5 - 5.4 = 1.1

$$S_D \sqrt{\frac{7.98}{62} + \frac{7.98}{39}}$$

$$= \sqrt{.129 + .205}$$

$$= \sqrt{.334}$$

$$= .5779$$

Then $\underline{t} = \frac{1.1}{.5779}$

$$= 1.903^*$$

$df = 120$

$$\left[\begin{array}{l} \underline{t}_{.05,120(OT)} = 1.658 \\ \quad _{.025,120(OT)} = 1.980 \end{array}\right] \qquad p < .05(OT)$$

Risk rate is:

$$\underline{p} = 1 - (1-.05)^2$$

$$= .10$$

$$\text{Est.}\underline{w}^2 = \frac{1.903^2 - 1}{1.903^2 + 62 + 39 - 1}$$

$$= \frac{3.62 - 1}{3.62 + 62 + 39 - 1}$$

$$= \frac{2.62}{103.62}$$

$$= .025 \text{ weak}$$

Legend: SUT = System Use Time

Exhibit 9 (continued)

SUT/13+ - SUT/1-6 = 6.5 - 5.1 = 1.4

$$S_D \sqrt{\frac{7.98}{62} + \frac{7.98}{30}}$$

$$= \sqrt{.1287 + .266}$$

$$= \sqrt{.1553}$$

$$= .628$$

Then $\underline{t} = \frac{1.4}{.628}$

$$= 2.229^{*}$$

$df = 120$

$$\left[\begin{array}{l} \underline{t}_{.025,120(OT)} = 1.980 \\ \quad .01,120(OT) = 2.358 \end{array}\right] \qquad p < .05(OT)$$

Risk rate is:

$$\underline{p} = 1 - (1-.025)^2$$

$$= .05$$

$$\text{Est.}\underline{w}^2 = \frac{2.229^2 - 1}{2.229^2 + 62 + 30 - 1}$$

$$= \frac{3.968}{3.968 + 62 + 30 - 1}$$

$$= \frac{3.968}{95.968}$$

$$= .04 \text{ weak}$$

Legend: SUT = System Use Time

Exhibit 10

t Ratios for Significance of Organizational Structure with System Use Time Mean Differences

$n_1 = 21$	$n_2 = 13$
$\Sigma X_1 = 104$	$\Sigma X_2 = 50$
$\Sigma X_1^2 = 696$	$\Sigma X_2^2 = 296$
$\bar{X} = 5$	$\bar{X} = 3.8$
$S_{e_1}^2 = 9.05$	$S_{e_2}^2 = 8.64$
$S_{e_1} = 3$	$S_{e_2} = 2.939$
$S_{\bar{X}_1} = .655$	$S_{\bar{X}_2} = .816$

$$S_D = .956$$

$$t = \frac{D}{S_D} = \frac{\bar{X}_1 - \bar{X}_2}{S_D} = \frac{5 - 3.8}{.956} = 1.255$$

$$df = n_1 + n_2 - 2 = 21 + 13 - 2 = 32$$

$$\left[\begin{matrix} t_{.15,30(OT)} = 1.055 \\ .1,30(OT) = 1.310 \end{matrix}\right]$$

$p < .15(OT)$

$$S_e^2 = \frac{(n_1 - 1)\ (S_{e_1}^2) + (n_2 - 1)\ (S_{e_2}^2)}{n_1 + n_2 - 2}$$

$$= \frac{(21-1)(9.05) + (13-1)(8.64)}{21 + 13 - 2} = \frac{181 + 103.68}{32}$$

$$= 8.896$$

$$S_D = \sqrt{\frac{S_e^2}{n_1} + \frac{S_e^2}{n_2}} = \sqrt{\frac{8.896}{21} + \frac{8.896}{13}} = \sqrt{.423 + .684}$$

$$= .956$$

Exhibit 11

Table of Work Environment Change Mean Differences, t Ratios for Significance of Work Environment Change Mean Differences

$$\bar{X}_{WP} - \bar{X}_{PRA} = 7.6 - 5.5 = 2.1$$

$$\bar{X}_{WP} - \bar{X}_{OS} = 7.6 - 4.4 = 3.2$$

$$\bar{X}_{PRA} - \bar{X}_{OS} = 5.5 - 4.4 = 1.1$$

$$S_D = \sqrt{\frac{7.98}{44} + \frac{7.98}{44}} = .6$$

So that:

$$t_{PRA/OS} = \frac{1.1}{.6} = 1.83^*$$

df = 120

$$\left[\begin{array}{l} t_{.05,120(OT)} = 1.659 \\ t_{.025,120(OT)} = 1.980 \end{array}\right]$$

Risk rate is:

$$p = 1 - (1-\alpha)^c$$

$$= 1 - (1-.05)^2$$

$$= .10$$

$$\text{Est.}\omega^2 = \frac{1.83^2 - 1}{1.83^2 + 44 + 44 - 1}$$

$$= \frac{2.348}{90.348}$$

$$= .0259 \text{ weak}$$

Legend: OS = Organizational Structure
PRA= Physical Room Arrangement
WP = Work Procedure

Exhibit 11 (continued)

So that:

$$t_{WP/PRA} = \frac{2.1}{.6} = 2.1^*$$

df = 120

$$\begin{bmatrix} t_{.05,120(df)} = 1.658 \\ .025,120(df) = 1.980 \\ .01,120(df) = 2.358 \end{bmatrix}$$

Risk rate is:

$$R = 1 - (1-\alpha)^c$$

$$= 1 - (1-.05)^2$$

$$= .10$$

$$Est.\omega^2 = \frac{2.1^2 - 1}{2.1^2 + 44 + 44 - 1}$$

$$= \frac{4.41 - 1}{4.41 + 44 + 44 - 1}$$

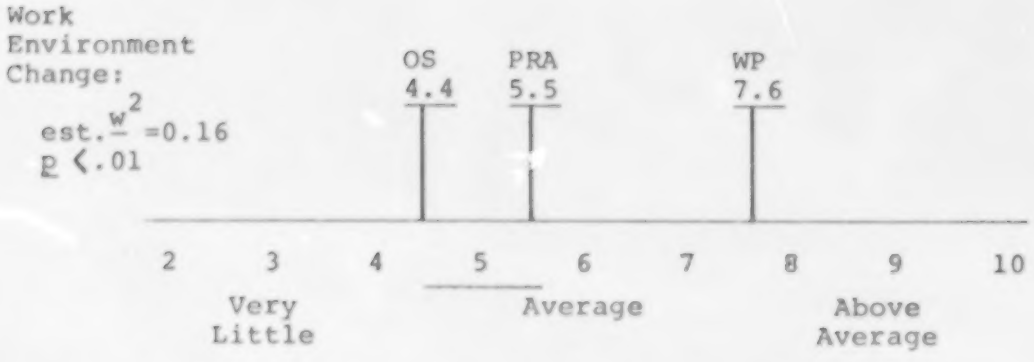
$$= \frac{3.41}{91.41}$$

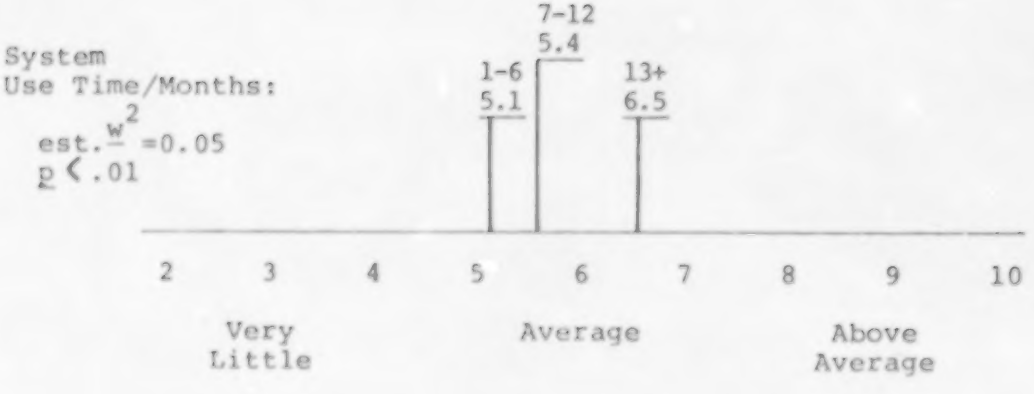
$$= .037 \text{ weak}$$

Legend: OS = Organizational Structure
PRA= Physical Room Arrangement
WP = Work Procedure

Exhibit 12

Graphic Display of Means and Associated Statistics

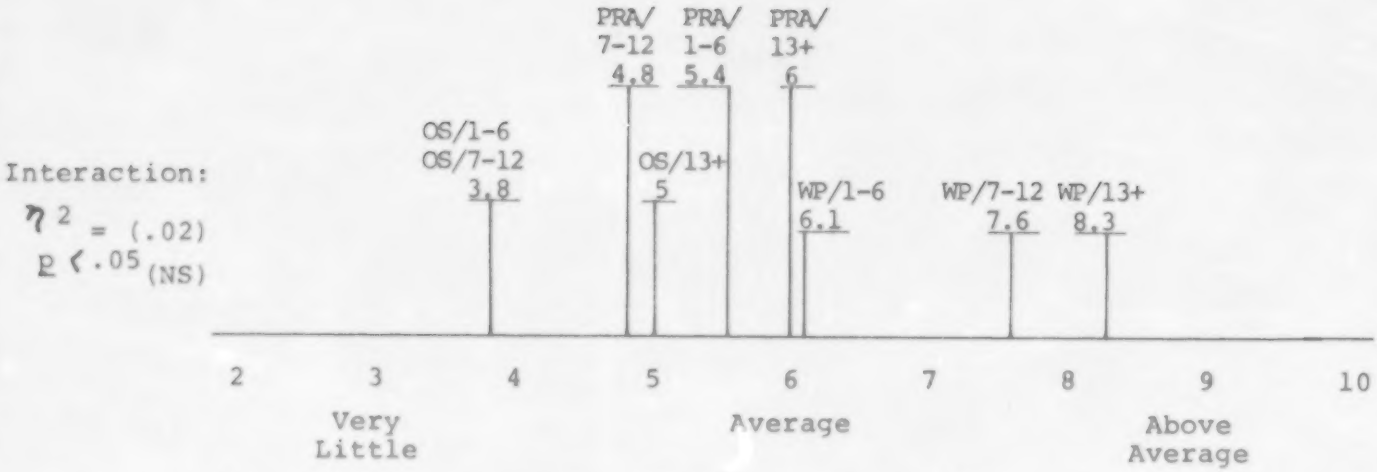




Tukey HSD tests for work environment change indicates that all mean differences covered by a bar (——) are not statistically significant. Mean differences for work environment change not covered by the same bar are statistically significant.

Legend: OS = Organizational Structure
PRA= Physical Room Arrangement
WP = Work Procedure

Exhibit 12 (continued)



Tukey HSD tests for work environment change indicated that all mean differences covered by a bar (——) are not statistically significant. Mean differences for work environment change not covered by the same bar are statistically significant.

Legend: OS = Organizational Structure
PRA= Physical Room Arrangement
WP = Work Procedure

"average" range of the thirteen-point scale. A subsequent Tukey HSD test indicated that the rating for work procedure was statistically higher than ratings for physical room arrangement and organizational structure. The differences were statistically significant at the 1 percent level of confidence. A subsequent t ratio test for significance of mean differences indicated that the rating for least change in work environment occurred in organizational structure while the greatest change occurred in work procedure. Both differences were statistically significant at the 5 percent level of confidence.

The test of system use time was statistically significant at the 1 percent level of confidence but was very weak, accounting for only some 5 percent of the variation. Mean ratings were one to six months, 5.1; seven to twelve months, 5.4; and over thirteen months, 6.5, all lying in the "average" range of the thirteen-point scale. A subsequent t ratio test for significance of mean differences indicated that the rating for change in system use time was higher in the over thirteen-month time frame than in the seven to twelve-month and one to six-month time frames respectively. The differences were statistically significant at the 5 percent level of confidence. Another t ratio test for significance of mean differences for change in organizational structure by system use time was higher in the over thirteen-month time frame than in the seven to

twelve-month/one to six-month time frames. The difference was not statistically significant at the 5 percent level of confidence.

The interaction effect and work environment change by system use time fell short of a statistical significance at the 5 percent level of confidence. The indication was that associated mean differences easily could have occurred by chance.

Chapter 6

DISCUSSION OF FINDINGS OF THE STUDY, IMPLICATIONS, AND FUTURE RESEARCH

The implications of the findings of the research problem and of the literature review lead to recommendations for future research. These aspects of the study are discussed in this chapter.

DISCUSSION OF FINDINGS OF THE STUDY

The underlying hypothesis of the study was supported: Evidence was shown that the greatest amount of change occurred in work procedure, the least amount of change occurred in organizational structure, and libraries using the system more than twelve months perceived more change in organizational structure than libraries using the system twelve months or less. These statements are made in the context of relative extents to which changes were perceived as a direct result of the installation and use of the BALLOTS shared cataloging system in the judgment of the head catalog librarian. Change in work procedure was rated higher than ratings for physical room arrangement and organizational structure, with the differences being such that they could be expected by chance alone far less than 1 time in 100.

The analysis of variance weak effects represented by values of eta-squared and estimated omega-squared and the larger percent of effect representing error indicated that effects have little or no forecasting value even though the effects are statistically significant at the 1 percent level of confidence. The interaction value of F was not significant; therefore, differences among the associated (cell) means represent simply additional chance variance.

The Tukey HSD test of significance of mean differences for work environment indicated that work procedure across all time frames was statistically significantly higher than changes in physical room arrangement and organizational structure at the 1 percent level.

Study findings indicated that greater change was perceived to occur as a function of longer system use time. The t ratio tests indicated that at the 5 percent level of confidence, greater change is perceived to occur in the over thirteen-month time frame of system use than at the seven to twelve-month and one to six-month time frames respectively.

The analysis of variance test for interaction effect did not meet statistical significance; therefore, mean rankings in Exhibit 12 on Page cannot be considered reliable. The variation associated with error in the analysis of variance accounted for some 78 percent of that of the total sample (eta-squared), this variation, of

course, being larger than the variation accounted for by any other part of the analysis.

Ordinarily, a large error variation is regarded as an indication that the study was not conducted and controlled tightly. It is believed such was not the case with this study. Because all candidates in the study population participated in the study, it is believed that the librarians were likely to be highly representative of any system users in a similiar context.

IMPLICATIONS OF THE STUDY AND FUTURE RESEARCH

It is believed that factors outside of the context of the study, such as those described in Appendix D, Part C, contributed to the various judgments expressed by the study population and that these factors are likely to be highly representative of any system users in a similiar context. Librarians seeking information regarding the effects which the BALLOTS automated shared cataloging system is perceived to have as reported by users of the system may benefit through study of these effects by anticipating and planning for change, especially in work procedure, while understanding that change is perceived to occur gradually as a function of system use time.

Although outside the scope of the study, the impression formed as a result of the literature review indicates that it would be expedient to provide an education

program to aid in communication, preparation of tools for change, and training for managers and employees in conjunction with the planning for the system. Were the BALLOTS organization to develop such programs and materials, it could conceivably have the market edge in this area and ensure chances for greater user satisfaction with the system.

To the extent that shared experience is useful, it would seem appropriate to recommend that the information gathered regarding the type of changes which occur in libraries as a result of the installation and use of the BALLOTS system be correlated with length of system use to determine whether relationships are significant and have forecasting value.

A capsule review of behavioral literature in Chapter 4 of this paper would indicate that innovation within an organization is complex and that certain organizational configurations and attitudinal orientations of decision makers and workers result in variations in innovativeness. David F. Gillespie and Dennis S. Mileti in a presentation to a symposium on organization and technology suggested that study has occurred focusing on how technology has influenced the attitudes of workers toward their jobs and on how technology affects organizational structure. They suggested a general and integrated model which studies the causal relationships among technology, structure, and behavior in

the organization.[1] The need for definition of objective measures is required, however, for both the knowledge and the process dimension.

The acknowledgement that little research has been accomplished to date which studies the impact of automation on library technical processing of bibliographic materials suggests that future research is required to determine objective measures for library processes and the causal relationships which technology, behavior, and structure have in the library work environment.

NOTES ON CHAPTER 6

[1]"Technology and the Study of Organizations: An Overview and Appraisal," The Academy of Management Review, II, 1 (January, 1977), 7-16.

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APPENDIX A

APPENDIX A

STUDY POPULATION

Key Number	Library Name
1	Alameda County Law Library, Oakland, CA
2	American Water Works Association, Denver, CO
3	Brigham Young University, Provo, UT
4	Brigham Young University Law Library, Provo, UT
5	California State Library, Sacramento, CA
6	California State University Library, Fresno, CA
7	California State Uniersity Library, Los Angeles, CA
8	Evanston Public Library, Evanston, IL
9	Flagstaff-Coconino County Public Library, Flagstaff, AZ
10	Fresno County Library, Fresno, CA
11	Golden Gate University Law Library, San Francisco, CA
12	Golden State University Library, San Francisco, CA
13	Graduate Theological Union Library, Berkeley, CA
14	Hoover Institution Library, Stanford, CA
15	Los Angeles County Law Library, Los Angeles, CA
16	Los Angeles County Public Library, Los Angeles, CA
17	Los Angeles Public Library, Los Angeles, CA
18	Mc George School of Law Library, Sacramento, CA
19	Memorex Corporation Engineering Library, Santa Clara, CA
20	Mills College Library, Oakland, CA
21	Marin City County Library, San Rafael, CA
22	Northern Trust Company Library, Chicago, IL
23	Palo Alto City Public Library, Palo Alto, CA
24	Quaker Oats Company Research Laboratories Library, Barrington, IL
25	Richmond Public Library, Richmond, CA
26	San Francisco Public Library, San Francisco, CA
27	San Jose City College, San Jose, CA
28	Santa Clara County Library, San Jose, CA
29	Shell Oil Company Library, Houston, TX
30	Stanford University Green Library, Stanford, CA
31	Stanford University Graduate School of Business Library, Stanford, CA
32	Stanford University Lane Medical Library, Stanford, CA
33	Stanford University Law Library, Stanford, CA
34	Syntex U.S.A., Incorporated, Library, Palo Alto, CA
35	Technology Development Corporation Library, Sunnyvale, CA
36	University of California General Library, Berkeley, CA

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37 University of California School of Law (Boalt) Library, Berkeley, CA
38 University of California General Library, Davis, CA
39 University of California Health Sciences Library, Davis, CA
40 University of California Law Library, Davis, CA
41 University of Nevada Library, Reno, NV
42 University of Santa Clara School of Law Library, Santa Clara, CA
43 United States Department of Energy Rockwell International Library, Golden, CO
44 Xerox Palo Alto Research Center Library, Palo Alto, CA

NOTE: The study population includes all libraries as of November, 1978, using the BALLOTS shared cataloging system for no less than three months.

APPENDIX B

APPENDIX B

STUDY POPULATION LIBRARY STATISTICS

Library Key Number	Collection Size	Library Type*	System Use Time (months)
1	95,135	S	1 - 6
2	1,440	S	7 - 12
3	1,317,548	A	7 - 12
4	2,500	A	1 - 6
5	840,469	P	13+
6	14,758	A	1 - 6
7	26,124	A	13+
8	300,000	P	13+
9	53,000	P	13+
10	827,626	P	1 - 6
11	2,345	A	13+
12	75,000	A	13+
13	291,045	A	1 - 6
14	1,250,000	A	13+
15	613,105	S	7 - 12
16	2,494,762	P	13+
17	2,791,874	P	13+
18	106,000	A	13+
19	1,000	S	7 - 12
20	179,526	A	13+
21	335,224	P	13+
22	4,000	S	1 - 6
23	192,008	P	1 - 6
24	5,500	S	13+
25	226,756	P	7 - 12
26	812,037	P	13+
27	63,926	A	7 - 12
28	987,024	P	13+
29	15,000	S	1 - 6
30	4,363,593	A	13+
31	254,243	A	13+
32	236,647	A	13+
33	75,411	A	13+
34	25,000	S	7 - 12
35	300	S	13+
36	4,917,330	A	13+
37	240,000	A	7 - 12
38	1,233,708	A	13+
39	86,000	A	13+

40	148,072	A	13+
41	512,811	A	13+
42	113,000	A	1 - 6
43	15,000	S	1 - 6
44	8,000	S	7 - 12

*Library Type: Academic (A), Public (P), Special (S)

Statistics Summary:

Collection Size	Number of Libraries
Large	13
Medium	12
Small	19

Library Type	Number of Libraries
Public	11
Academic	22
Special	11

System Use Time/Months	
13+	25
7 - 12	9
1 - 6	10

APPENDIX C

APPENDIX C

STUDY QUESTIONNAIRE

Library _____

Cataloger _____

The following is a study of your judgment of the amount of change which your library technical processing department experienced as a direct result of the installation and use of BALLOTS. For the purposes of this study I have defined the technical processing department to include all activities associated with the acquisition and cataloging of library materials.

I will ask you to identify changes made in three different areas of your work environment: physical arrangement, work procedure, and organizational structure. I will also ask your opinion of the amount of change which has occurred in each of the three areas. You may find that in your judgment the amount of change has been none, very little, average, above average, or great.

The library literature describes some changes which have occurred in physical room arrangement by libraries installing shared cataloging systems. Has your library experienced any of the following changes in room arrangement:

_____ Rearrangement of desks
_____ Separate work area(s) created for terminals
_____ Relocation of entire work unit
_____ Creation of hold shelves for books awaiting Library of Congress MARC copy
_____ Elimination of backlog shelving

Describe any other changes in physical room arrangement resulting directly from the installation of BALLOTS:

The library literature describes some changes which have occurred in work procedure by libraries installing shared cataloging systems. Has your library experienced any of the following changes in work procedure:

_____ More rigid staff scheduling
_____ Batching of desk work
_____ Extension of technical processing work hours
_____ Sequence of work flow
_____ Reassignment of duties
  _____More generalized duties for nonprofessionals
  _____Less clerical work for professionals
  _____More specialized knowledge for catalogers

Describe any other changes in work procedure resulting directly from the installation of BALLOTS:

The library literature describes some changes which have occurred in organizational structure by libraries installing shared cataloging systems. Has your library experienced any of the following changes in organizational structure:

_____ Merger of work units (bibliographic searching and cataloging)
_____ Creation of new work units (quick cataloging)
_____ Elimination of work units (card production)
_____ Reduction of staff
  _____ Professional
  _____ Paraprofessional
  _____ Clerical
_____ Creation of new positions

Describe any other changes in organizational structure resulting directly from the installation of BALLOTS:

Indicate whether, in your judgment, the amount of change which occurred as a result of the use of BALLOTS was great, above average, moderate, very little, or none in:

Physical Room Arrangement

Great _____ 13 12 11

Above average _____ 10 9 8

Average _____ 7 6 5

Very little _____ 4 3 2

None _____ 1

Work Procedure

Great _____ 13 12 11

Above average _____ 10 9 8

Average _____ 7 6 5

Very little _____ 4 3 2

None _____ 1

Organizational Structure

Great _____ 13 12 11

Above average _____ 10 9 8

Average _____ 7 6 5

Very little _____ 4 3 2

None _____ 1

What were the positive factors, if any, influencing the amount of change in work environment resulting directly from the installation of BALLOTS.

What were the negative factors, if any, influencing the amount of change in work environment resulting directly from the installation of BALLOTS.

APPENDIX D

APPENDIX D, PART A

WORK ENVIRONMENT CHANGES

Change in Physical Room Arrangement:	Responders
Rearrangement of desks	31
Separate work area(s) created for terminals	21
Relocation of entire work unit	3
Creation of hold shelves for books awaiting Library of Congress MARC copy	13
Elimination of backlog shelving	6
Rearrangement of entire work area	3
Change in Work Procedure:	
More rigid staff scheduling	5
Batching of desk work	20
Extension of technical processing work hours	5
Sequence of work flow	37
Reassignment of duties	31
--More generalized duties for nonprofessional	4
--Less clerical work for professionals	4
--More specialized knowledge for catalogers	3
Less rigid staff scheduling	2
Change in Organizational Structure:	
Merger of work units (bibliographic searching and cataloging)	4
Creation of new work units (quick cataloging)	20
Elimination of work units (card production)	6
Reduction of staff	7
--Professional	2
--Paraprofessional	3
--Clerical	2
Creation of new positions	5
Redefinition of job descriptions	9

APPENDIX D, PART B

WORK ENVIRONMENT CHANGE RATING BY LIBRARY KEY NUMBER

Library Key Number	Work Environment Change		
	Physical	Procedural	Organizational
1	2	3	1
2	3	5	1
3	3	10	6
4	5	6	1
5	6	8	6
6	3	6	6
7	4	7	6
8	4	6	5
9	6	12	5
10	10	6	9
11	6	8	7
12	8	10	6
13	7	11	6
14	6	5	2
15	6	11	10
16	6	2	2
17	9	8	10
18	6	10	4
19	2	4	1
20	2	11	10
21	6	8	3
22	7	10	1
23	9	9	7
24	4	9	1
25	7	10	5
26	10	12	10
27	7	10	6
28	11	12	10
29	2	3	1
30	11	12	2
31	1	2	1
32	6	10	5
33	5	10	2
34	2	6	1
35	3	2	1
36	10	10	7
37	5	10	5
38	5	5	4
39	3	5	2
40	5	9	3
41	6	8	3
42	8	5	5
43	1	2	1
44	6	7	2

APPENDIX D, PART C

POSITIVE AND NEGATIVE FACTORS

Positive Factors Influencing Change in Work Environment:

- Favorable staff attitude
- Support of library administration
- Assistance from and experience of other libraries
- Anticipation of faster materials processing
- Anticipation of cost displacement

Negative Factors Influencing Change in Work Environment:

- Limitation of personnel contract
- Poor staff attitude
- Disinterest by library administration

APPENDIX E

APPENDIX E

WORK ENVIRONMENT CHANGE RATING BY
LIBRARY SYSTEM INSTALLATION DATE

Installation Date	Library Key Number	Work Environment Change		
		Physical	Procedural	Organizational
System Use Time: 1-6 Months				
Aug., 1978	4	5	6	1
	6	3	6	6
	10	10	6	9
	22	7	10	1
	43	1	2	1
July, 1978	42	8	5	5
May, 1978	29	2	3	1
April, 1978	1	2	3	1
March, 1978	13	7	11	6
	23	9	9	7
System Use Time: 7-12 Months				
Feb., 1978	2	3	5	1
Jan., 1978	3	3	10	6
	25	7	10	5
Oct., 1977	15	6	11	10
	19	2	4	1
	37	5	10	5
	44	6	7	2
Sept., 1977	27	7	10	6
	34	2	6	1
July, 1977	24	4	9	1
	36	10	10	7
	38	5	5	4
June, 1977	35	3	2	1
System Use Time: 13+ Months				
May, 1977	31	1	2	1
	32	6	10	5
March, 1977	11	6	8	7
	39	3	5	2
	40	5	9	3
Jan., 1977	20	2	11	10
Dec., 1976	8	4	6	5
Oct., 1976	14	6	5	2
Sept., 1976	16	6	2	2
	17	9	8	10
	21	6	8	3
	26	10	12	10
	33	5	10	2

Appendix E (continued)

Installation Date	Library Key Number	Work Environment Change		
		Physical	Procedural	Organizational
Aug., 1976	9	6	12	5
	18	6	10	4
	28	11	12	10
	41	6	8	3
July, 1976	5	6	8	6
	7	4	7	6
	12	8	10	6
	30	11	12	2